old leaves are full of a watery acrid juice, which stains white cloth an indelible black or dark brown. The fibres of the leaves make a textile fabric of great beauty, known as a fine kind of grass cloth.

In cultivation the plants are set closely, the Chinese banana requiring only three or four feet between the rows, and the clusters are gathered before they are quite ripe, and hung up in some cool place, or better still, buried in the earth. Some bananas are certainly improved by this premature gathering, but others are much better when ripened in the natural way. The prices on the Isthmus of Panama, and at most tropical ports, varies from a real (12½ cts.) to a dollar, according to the size of a bunch and the season of the year. The prices asked in the Boston market are simply outrageous, and our fruit-dealers let the fruit rot in their windows rather than lower the price.

A plantation will yield all the year round by timing the planting, but the crop is much more abundant at one season. The care the plants require is little enough if they are planted by a brook or in moist ground, and the bunches of fruit may weigh eighty, or even more than a hundred pounds when ripe.

The geographical limits of the banana are much more extensive than those of the cocoanut, and extend even beyond the tropics.

DIRECTIONS FOR COLLECTING LAND AND FRESH-WATER SHELLS.

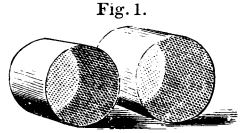
BY JAMES LEWIS, M. D.

If the collector is provided with suitable apparatus for gathering certain classes of shells, his work is more than half done when he has *found* them. This is especially true of land shells. The apparatus needed for these is simply

a tin canister, of sufficient size to hold all that may be secured at one time of species as large as *Helix monodon*, or larger. A large wide-mouthed bottle may answer the same purpose. The canister should have an easy fitting cover perforated for ventilation. The cork to the bottle may be perforated. For species less than *H. monodon* (one-third inch diameter), a bottle of alcohol that may be carried in the vest pocket will be desirable. The larger species are picked up by hand without any aids. The small species are often so fragile and so minute that a pair of delicate pliers, some like the light pliers used by watchmakers, but having wider blades, will be found so useful as to be indispensable. With the pliers the small shells can be rapidly picked up and conveyed to the alcohol. The use of the alcohol is to contract the soft parts to the smallest dimensions, by extracting the water they contain. It leaves the shells in a cleaner condition than when they are allowed to crawl over and cover each other with mucus and dirt. If it be desired to preserve specimens of those mollusks that are destitute of shells for anatomical purposes, they should have a separate bottle of alcohol to keep their mucus from enveloping the shells of small species.

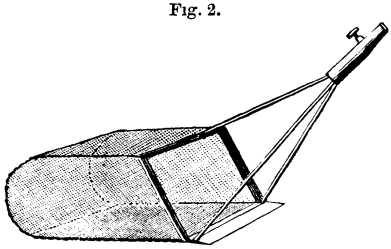
To collect fresh-water shells the collector needs sometimes only his hands, especially in narrow rivulets where everything can be seen and reached from either side of the water. He needs a bucket of water for larger species,—a bottle of alcohol for minute species that would be likely to become lost or broken by association with the larger. Usually only a bucket of water is needed. For all those classes that crawl on or burrow in mud, some sort of *dredge* is needed. The simplest device that can be suggested is a tin dipper (Fig. 1), the handle of which may be made of any convenient length by adding thereto a light wooden rod. With a finely perforated instrument thus arranged, a film of mud with shells intermingled may be scraped up, the mud sifted

Fig. 1.



out, the shells remaining. The shells may be emptied into the bucket of water, and the dredging continued as long as desirable. For more rapid progress in collecting, a net made of iron wire-gauze, of about twelve to sixteen wires to the linear inch, is very useful (Fig. 2). The gauze may be stretched over a stiff metallic frame, so arranged as to form a bag, the mouth of which is about eight inches by four, with a depth of about eight inches. The net should be fixed at an angle of 45° with the handle. The outer margin (at the mouth of the bag) should have a sharp metallic edge like a hoe. A long handle is necessary; one that may be separated into parts, each about three or four feet long is most convenient, on account of the facility of adapting the length of the handle to the depth of the water, or to the position from which the collector has to work.

Fig. 2.



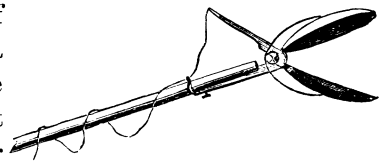
With a properly arranged apparatus of this kind, nearly all the small univalve and bivalve aquatic species may be secured with more readiness and in greater abundance than by other means. The shells that cannot be so readily obtained in this way are the fresh-water limpets (*Ancylus* and *Gundlachia*), which have to be taken by the slow process of removing them simply from the stems of plants or surfaces of stones to which they adhere, by sliding a knife-blade under them.

Many small species of fresh-water mussels (*Unionidæ*), such as are sometimes found abundantly in some of the Southern and Western rivers, are often readily attainable by means of the net. By proper manipulation the net may be made to scrape up a thin or thick slice of mud with the shells that mingle with it. Then reversing the net in the water, mouth upward, the sand and fine mud are sifted out, care

being taken not to fracture fragile shells, or break the brittle margins of univalves by too violent shaking. Shells that adhere to flat smooth rocks may be taken expeditiously with the net.

To take Uniones, the collector will succeed best in shallow water by wading. Long rubber boots are desirable for this work; also, a pair of metallic tongs (Fig. 3), the handle of one blade lengthened by a wooden rod, to be held by one hand to direct the instrument in its work, while the other hand pulls a cord that causes the other blade to close on the specimens to be taken. A basket carried on the arm serves to hold the specimens, which should be handled carefully.

Fig. 3.



An iron garden rake may sometimes be used with much advantage to uncover species where the current will wash away the turbid water. When the water is cleared, the shells may be seen and can be picked up by means of the tongs, net, or dipper, or even with the rake, if not too small. In lakes and ponds, where the bottom is muddy and the Uniones can be seen from a boat, the dipper, used so as not to make the water turbid, will answer the purpose. If the bottom is gravel the tongs may be used. In deep dark water in rivers, Uniones are sometimes drawn ashore in seines used for fishing. They have also been secured by means of rakes.

It often happens that there are small mollusks that feed on aquatic plants, and can seldom be found elsewhere. This is the case in lakes and in rivers that have only a moderate current. Such species will seldom be obtained with either net or dipper, and the collector will be obliged to content himself with slower processes. By carefully lifting the weeds out of the water the little mollusks may be found on the stems and leaves. They very usually detach themselves when disturbed, but if they are once fairly above the water,

very few are lost, for the reason that they continue to adhere to the wet weeds by capilarity. The pliers will be needed to pick them off and transfer them to the bottle of alcohol.

Preparation and Preservation of Specimens.—Land-shells and the larger aquatic univalves are generally cleaned, after boiling them a few minutes to detach the soft parts, by means of a little hook with which to remove the soft parts, a tooth-brush to wash the shell externally, and a syringe with which to rinse the interior of the shell. Sometimes the interior has also to be wiped out with a bit of cotton wound on a splinter of wood. The more perfectly a specimen is cleaned the more agreeable is its appearance. If portions of the soft parts remain in the shell the offensive odor of decomposition remains a long time. In the preparation of *Paludina* it is desirable to secure the opercle of each specimen in the shell to which it belongs, by means of thick mucilage. Some species of *Melanidæ* that have peculiarly formed opercles should receive similar attention. The larger species of *Sphærium* may have the soft parts removed, and the valves tied shut to dry. The smaller bivalves will dry if spread on paper in a moderately cool place with a free circulation of air, only a few of the shells gaping. If exposed to the sun they are very apt to open. Small shells like *Amnicola*, *Bythinella*, *Valvata*, etc., may be quickly dried in the sun after having been in alcohol twenty-four hours. The same remarks apply to some land-shells, such as the smaller *Helices*, *Pupa*, *Vertigo*, *Carychium*, etc. *Vitrina*, if carefully managed, may have the soft parts removed after boiling, or after having been in alcohol twenty-four hours. Cleaned and rinsed, the shells are exceedingly beautiful. But dried in the manner too often witnessed, they are not a very attractive addition to a collection of well-selected specimens. In the treatment of *Succinea*, either boiling, or twenty-four hours in alcohol, will answer, preparatory to the removal of soft parts.

Some mollusks, the shells of which are thin and transpa-

rent, when prepared for the cabinet simply by drying the soft parts, can never be made to have that brilliancy that is seen in a carefully cleaned specimen. By the side of well-cleaned specimens they are so inferior in their appearance, that when the collector has once had an opportunity to compare them, he will never be content with indifferently cleaned specimens. *Physa hypnorum* is a species to which these remarks will apply. It is, however, a very difficult species to clean perfectly on account of the persistence with which the soft parts adhere within the apical whorls. But by an adroit expedient this difficulty may be overcome. After the shells have been boiled a few moments, take each specimen up singly, and hold the apex a few seconds against the blaze of a lamp or candle. Soon a small quantity of steam forms with a slight explosion that loosens the soft parts perfectly. A jet of water from a syringe will then remove the soft parts and rinse the shell at one operation. *Physa hypnorum* may be kept in alcohol several months until partial decomposition has begun. Then with a powerful jet of water from a very small syringe, the soft parts may be instantly and wholly removed. The same modes of treatment may also be applied to other species. Shells kept long in alcohol, however, are liable to become stained. *Lymnæa gracilis* permits the soft parts to be removed with the utmost ease and certainty by boiling or by the alcoholic treatment. *Ancylus* is very easily prepared after having been in alcohol. Indeed most of the specimens treated with alcohol will be found with the soft parts detached after a few days.

Uniones (fresh-water mussels) require to be cut open with a knife to divide the muscles, after which the soft parts should be carefully removed, leaving no traces of them to stain the shell. An easier and more expeditious mode is to boil them, when the muscular attachments are destroyed, and the soft parts are ready to drop out. After the soft parts are removed the shells need to be rinsed clean, and before the hinge-ligament gets dry the valves should be tied

shut, taking care to preserve perfect every part of the shell, not forgetting even the epidermal fringe. Specimens that have had the soft parts removed by cutting, are usually more brilliant than if boiled, or if the soft parts are simply macerated or dried.

Rare specimens of *Unionidæ* are sometimes found where the musk-rat has accumulated shells. It is sometimes an object with the collector to preserve shells found only under such circumstances. Such specimens when carefully washed will often be found to have a dull chalky appearance that is not indicative of the true character of the species. The brilliancy of the shell may be measurably restored by dipping it a few seconds in a bath of *dilute muriatic* or *nitric acid*, then rinsing with clear water and wiping dry.

Since naturalists have come to regard a collection according to the *perfection* of the specimens it includes, the habits that collectors were accustomed to indulge, in their attempt to beautify specimens, have pretty much gone out of use. It is no longer considered necessary to remove the epidermis of shells in order to develop unrevealed beauties, except perhaps in specimens intended to adorn a mere collection of curiosities. Even *varnish*, which once was so liberally applied to shells to impart a fictitious gloss, is now no longer used by those who aim to serve the purposes of science. Yet there are some circumstances under which a somewhat defective specimen may have its *natural* appearance partly restored, even when apparently of little value. After cleaning the shell carefully with a brush, moisten the whole surface with a dilute solution of gum arabic, wiping off the surplus. The gum when dry takes the place of the albuminoid tissues that have been dissolved out of the surfaces of the shell, measurably restoring its natural appearance.

Young collectors are often annoyed, after they have taken much pains to prepare fine specimens of *Anodonta* and some thin-shelled *Uniones*, to find that their specimens crack when dry, sometimes falling in pieces. This difficulty may be

avoided by dipping fresh specimens into a solution of *chloride of calcium*,—a hygrometric salt that always retains enough moisture to remain in solution under ordinary conditions of atmosphere and temperature. This salt may be prepared by neutralizing *hydrochloric* (or *muriatic*) *acid* with chalk.

The use of *varnishes*, *oils*, *glycerine*, etc., on shells is not recommended. A very thin solution of *gum arabic* has this advantage,—that if found objectionable it may be readily washed off without detriment to the most fragile specimen. From the general tenor of the preceding remarks on collecting, it will be understood that *perfect specimens* are above all others the most desirable. Such, usually, can be obtained only by securing them alive. When a species is abundant and the collector has obtained a large series of specimens, he will be able to select those which best represent its character. It is, perhaps, policy to return the younger and imperfect specimens to the station from which they were taken, as by so doing the species may continue with only slight diminution of numbers.

The collector is urged to avail himself of *opportunity* on all occasions to secure species, however abundant or undesirable they may seem to be at the moment. Many mollusks are noted for appearing in abundance for a brief period, then disappearing for a number of years. Sometimes artificial influences destroy a locality that produces abundant specimens of desirable species. The erection of a mill, or some chemical establishment on a stream, sometimes kills out many of the mollusks it would otherwise continue to produce. Tanneries, asheries, saw-mills, dye-houses, in fact all kinds of manufacturing establishments on streams interfere with the mollusks and other forms of life inhabiting them.

Incidentally, the collector of shells will unavoidably have his attention drawn to many other forms of life while seeking mollusks. Scarcely any of these will be so insignificant

that they may not deserve passing notice. While collecting land-shells, opportunities are often presented for securing specimens of valuable species of insects, crustaceans, and worms, especially rare and curious species of beetles and centipedes, whose habits necessarily lead them to seek shelter and concealment with the larger snails. The *chrysalides* of various species of *Lepidoptera* are also found in similar situations, and may be secured and preserved as a means of obtaining more perfect specimens of the mature insects than can be obtained by hunting the insects themselves. Various species of *Salamanders* (or "lizards," as they are often termed for want of a more appropriate name) may also be found in the damp grounds where snails seek shelter under logs, etc.

In searching for aquatic mollusks, many rare species of fish of small size, such as are just suited for the aquarium, will often be found and captured with the mollusks. Stagnant waters are rich in various forms of insect life, and some of the species are remarkably interesting for their singular forms and curious habits. In such situations will be found both the *larvæ* and perfect insect of several species of *Dytiscus* and allied genera, some of the species quite large, others quite small. Such stagnant waters also produce various other kinds of insects (see Vol. I, p. 328, fig. 2; p. 436, fig. 2), including those that *swim* and *skate* (Vol. I, p. 328, fig. 3) about over the surface of the water as well also as those that propel themselves boat-like *in* the water (Vol. I, p. 328, fig. 1). A limited class of *crustaceans* and *annelids* are found in similar stations,—all of them objects of curious interest, not less on account of the singularity of their forms than on account of the wonderful habits that disclose their adaptation to the conditions in which they are found.

To the microscopist, also, the stagnant water offers a world for investigation (Vol. I, plate 13, illustrates some of the forms). A little tuft of the green slimy vegetation that in such situations is found adhering to sticks, twigs, in

fact every surface covered by the water, is full of life in some of its most singular and wonderful forms, some vegetable, some animal (Vol. I, pp. 505 to 530 inclusive; also 587 to 595).

The stagnant pool is also the winter residence of numerous species of frogs and other *Batrachians*, for whose songs we listen in the warm showery evenings of the opening spring. Hither come also the wanderers in the fields and forests to deposit their eggs, which appear first endowed with life as minute *pollywogs* or *tadpoles*, ultimating in toads and frogs. The eft, or water-newt, a small brown *salamander*, marked with curious spots, is also found in the stagnant waters; and pools, on the borders of marshes, are the homes of various species of turtles. The larvæ of mosquitoes, of which our country has a great variety of species, abound in stagnant waters, and they will be readily found in every little puddle that has been a few days exposed to the sun's warming influence.

In the streams where there is greater purity of water, insect life is not so apparent. But here we have the curious cray-fish (*Astacus Bartonii* of the older writers) that in miniature apes the form of his marine cousin, the lobster. Here abound the larvæ of various species of dragon-fly (Vol. I, p. 279, fig. 5; Plate 9, fig. 1 to 7; p. 307, fig. 1; pp. 308, 309, 311) in somewhat greater abundance than in the crowded stagnant waters,—also the *larvæ* of various species of Caddis-flies (*Phryganea*), who form for their protection little tubes composed of fragments of wood, straws, etc., connected together by the silken secretion of the young insect. In rivers and lakes on the stems of aquatic plants, in June and July, will be found beneath the surface of the water numerous *pupæ* of a beautiful beetle, the mature insects glistening with burnished steel and bronze, flitting about and sunning themselves on the aquatic vegetation.

Life abounds around us everywhere. To call attention to a few forms that do not daily challenge familiar attention

has been the object of this paper. The subject is one full of interest,—one that has received the attention of the most vigorous intellects, and yet remains as full of undiscovered truths as in the beginning,—being, as are all the works of nature, a field of infinite variety, inexhaustible.

A COMICAL OWL.

BY CHARLES WRIGHT.

THE owl is called a solemn bird. It may be so; yet I have seen one in Cuba whose actions would upset the gravity of a very sober meeting.

The bird in question (*Glaucidium Siju* Orbigny) was taken young from the nest, and grew quite tame and familiar. His ordinary food consisted of lizards, though he would eat moths and other large insects. His power of swallowing was surprising. From the first, almost, he could dispose of the smaller lizards; but soon gained strength and throat capacity to take in specimens as long, if not quite so large, as himself; even two, three, or more at a meal. He usually commenced by tearing away, awhile, at the head, which, however, he did not seem to diminish much in size; after which came the effort, sometimes a protracted one, to swallow it entire—head foremost. With time, however, it took its regular supper (it had but one meal a day) with little apparent effort, unless an uncommonly large bit was given him. And so much did his appetite increase, that sometimes a scarcity prevailed; whether it occurred from the neglect of the negrito to cater faithfully, or from the paucity of the game. By day, he remained, solemnly, in the corridor, dosing away the lonely hours on a pigeon-cage, or on the beam supporting the eaves. Before learning to fly well, at night, after candle-lighting, he was taken down and placed